ACUTE CORONARY SYNDROMES

Assessing patients' beliefs about cardiac rehabilitation as a basis for predicting attendance after acute myocardial infarction

A F Cooper, J Weinman, M Hankins, G Jackson, R Horne

Background: Some sociodemographic and psychological variables such as patients' belief about illness are associated with attendance at cardiac rehabilitation. Exploration of patients' beliefs about treatment regarding cardiac rehabilitation has been limited to qualitative studies; their role in relation to attendance at cardiac rehabilitation after acute myocardial infarction (AMI) remains speculative.

Objectives: To develop a valid and reliable measure of patients' beliefs regarding cardiac rehabilitation and to ascertain the relationship between such beliefs and attendance.

Design: A prospective questionnaire-based study.

Setting: Coronary care unit of a London teaching hospital.

Patients: 130 patients with AMI; 104 (83%) men; mean age 58.4 (standard deviation (SD) 10.7) years.

Interventions: Patients completed a 26-item questionnaire consisting of statements pertaining to beliefs about cardiac rehabilitation.

Main outcome measures: Cardiac rehabilitation attendance; beliefs of patients about cardiac rehabilitation.

Results: Four subscales pertaining to patients' beliefs about cardiac rehabilitation were produced, accounting for 65.3% of the attendance variance: perceived necessity of cardiac rehabilitation ($\alpha = 0.71$), concerns about exercise ($\alpha = 0.79$), practical barriers ($\alpha = 0.70$) and perceived personal suitability ($\alpha = 0.74$). Patients who attended were more likely to believe that cardiac rehabilitation was necessary and to understand its role compared with non-attenders (17.7 (SD 2.7) v 16.9 (SD 3.0), p = 0.029). Patients who thought cardiac rehabilitation was suitable for a younger, more active person were less likely to attend (5.6 (SD 1.9) v 4.6 (SD 1.7), p = 0.007). Patients who expressed concerns about exercise or who reported practical barriers to attendance were less likely to attend, although these did not reach statistical significance.

Conclusion: Beliefs about cardiac rehabilitation can be quantified and differ between attenders and non-attenders of cardiac rehabilitation.

See end of article for authors' affiliations
....

Correspondence to:
A F Cooper, Guy's & St Thomas' NHS Foundation Trust, St Thomas' Hospital, Cardiothoracic Centre, 6th Floor, East Wing, London SE1 7EH, UK; alethea.cooper@gstt.nhs.uk

Participation in comprehensive cardiac rehabilitation programmes reduces cardiac mortality by 26%,[1] all-cause mortality by 13% and non-fatal myocardial infarction by 38%.[2] The reduction in all-cause mortality has been shown to persist over time, with a risk ratio of 0.53 (95% confidence interval (CI) 0.35 to 0.81) at 24 months and 0.77 (95% CI 0.74 to 0.94) over 5 years.[2]

Despite evidence for effectiveness and patient referral to cardiac rehabilitation programmes by their doctors, suboptimal attendance at cardiac rehabilitation is an international problem. A systematic review of 18 studies included patient samples from New Zealand, the US and the UK[3]; attendance figures varied between 13% and 70%, and averaged 43%—recent studies from France[4] and Australia[5] also reported similar attendance figures.

In the UK, the National Service Framework for Coronary Heart Disease emphasises the need to improve uptake of cardiac rehabilitation courses.[6] A systematic review identified sociodemographic variables and beliefs about illness but not medical variables to be related to non-attendance[3]; patients who were older, had a lower income or were more deprived, and who were more likely to deny the severity of their heart condition or believe they had little or low personal control over the course of their heart condition were less likely to attend. The early identification of potential non-participants would enable the delivery of interventions to target modifiable variables such as illness perceptions to maximise course uptake.

Research has shown that patients' beliefs about their treatment can strongly influence their adherence.[7–10] The Necessity–Concerns framework suggests that patients' beliefs are categorised into specific beliefs about the necessity and efficacy of treatments prescribed for specific conditions; specific concerns regarding the potential or actual harmful effects of treatments prescribed for specific conditions; and general beliefs regarding the overuse and harmful effects of treatment.[8] Concerns also almost certainly reflect an emotional reaction, particularly worry or anxiety. Higher adherence is found in those patients who have stronger beliefs in the necessity of their treatment and less concerns about factors such as dependence and side effects.

Qualitative studies have investigated patients' beliefs about cardiac rehabilitation. Participants and non-participants have been interviewed at varying time points after acute myocardial infarction (AMI) and attendance at cardiac rehabilitation programmes. Non-attenders were likely to hold misconceptions regarding rest and not exerting themselves.[11] They also seemed to lack awareness of course content and to perceive that cardiac rehabilitation would involve mainly physical exercise, and would thus be selectively appropriate for patients previously considered "fit".[12] [13] This concern about "fit patients" was also reported as a perceived possible disadvantage and as an initial cause of discomfort among participants.[14]

We conducted an interview study[15] with patients who had had AMI after discharge from hospital but before course attendance,

....
Abbreviations: AMI, acute myocardial infarction; IPQ-R, Illness Perception Questionnaire—Revised

and the study yielded findings similar to those reported earlier. Those patients who subsequently did not attend or expressed doubts about attendance were less likely to understand the content, more likely to associate cardiac rehabilitation with exercise and more likely to express concerns about physical activity after AMI and advocate rest.

In this study, we have attempted to build with these findings and the Necessity–Concerns framework[7] to develop a valid and reliable measure of patients' beliefs regarding cardiac rehabilitation and to ascertain the relationship between such beliefs and attendance after AMI.

PARTICIPANTS AND METHODS
The local research ethical committee approved the study.

Study design and setting
This was a questionnaire-based study conducted prospectively in consecutive patients with AMI admitted to the coronary care unit of a teaching hospital, Guy's & St Thomas' Hospital, London, UK, between June 2000 and June 2002.

Participants
The criteria for inclusion and exclusion were as follows:

- *Inclusion criteria*: Patients who had had uncomplicated AMI (confirmed by rise in troponin and creatine kinase levels, and changes on the electrocardiogram) and who were thus eligible for attending the cardiac rehabilitation course.
- *Exclusion criteria*: Patients who were not offered the cardiac rehabilitation course because of concurrent debilitating comorbidity, and patients unable to read or write English.

Patient recruitment and questionnaire completion
Participants completed the baseline questionnaire during their inpatient stay. They had received an explanation of a heart attack, advice regarding secondary prevention and an invitation to participate in the cardiac rehabilitation course from a nurse member of the cardiac rehabilitation team. Questionnaire completion took place after the nurse visit, on day 3 or 4 of admission.

Item generation for proposed beliefs about the cardiac rehabilitation questionnaire
Items were primarily generated according to results from the interview studies described previously,[11–15] and were also consistent with the Necessity–Concerns framework.[7] Concerns such as reservations about undertaking physical activity and, more specifically, the perception that exercise may actually be harmful were included. The possible deterrent of practical barriers, including return to work, transport difficulties and commitment to family responsibilities, were also included as potential concerns. Items to capture the belief that cardiac rehabilitation was generally a necessary part of treatment, or, by contrast, that cardiac rehabilitation was unnecessary, especially according to the patient's personal model of heart attack, were also included; a more specific aspect of necessity, particularly that participation in the cardiac rehabilitation programme would enable the patient to return to work, was also included.

The 26 items were rated on a 5-point Likert-type scale: from 1, strongly disagree, to 5, strongly agree.

Face validity
Nursing staff for cardiac rehabilitation, cardiologists and patients hospitalised for AMI were asked their opinion regarding the range and relevance of questions. Response to the range and relevance of items was positive, with no additional items suggested.

Measures
Along with the beliefs about cardiac rehabilitation items, the following measures were included on the baseline questionnaire:

1. Sociodemographic data

    a. Age
    b. Marital status
    c. Employment status

2. The Illness Perception Questionnaire—Revised (IPQ-R),[16] which assesses perceptions (beliefs) about the timeline, personal control, treatment control, consequences, emotional effect and coherence of the heart condition.

3. Intention to attend cardiac rehabilitation (yes, no or unsure).

4. Regular participation in planned exercise or sport (yes or no), and the type of exercise as well as frequency, length of time and number of months/years of participation.

5. Activity level before the heart attack: low (eg, walking, light housework or weeding); medium (eg, brisk walking, cycling or housework); high (eg, jogging, swimming or heavy gardening).

6. Views about exercise—for example, ''Exercise may be harmful to me'' or ''I should avoid exercise if I feel tired''. Responses were rated on a 5-point Likert scale (5 items; score range 5–25). A higher score reflects a more positive view about undertaking exercise.

7. Hospital Anxiety and Depression Scale.[17] Both anxiety and depression were assessed through seven items, with a score range of 0–21; scores are rated according to the status of the case: not present, 0–7; possible, 8–10; and probable, 11–21.

Patient attendance at cardiac rehabilitation programmes was ascertained retrospectively by referring to records of attendance kept by the cardiac rehabilitation centre staff.

Statistical analysis
The 26 items were analysed using principal components analysis to identify reliable subscales. Subscale reliability was further confirmed by Cronbach's α, a measure of reliability ranging from 0 (unreliable) to 1 (perfect reliability). Correlations between subscales were analysed using Pearson's correlation coefficients. The t test was used to assess the discriminant validity of the subscales by examining differences in scale scores between attenders and non-attenders of the cardiac rehabilitation programme. The construct validity was assessed by the degree of intercorrelation between the subscales and the other measured variables in hypothesised ways, including intention to attend cardiac rehabilitation (independent-samples t test), scores on the IPQ-R[17] (bivariate correlations, Pearson's correlation coefficient), baseline levels of exercise (analysis of variance with Tukey's honestly significant difference post-hoc testing for between-group differences), views about exercise (independent-samples t test) and causal attributions to heart disease (independent-samples tests: Mann–Whitney U test or t test, mean (SD) reported). Owing to the number of statistical tests carried out to establish construct validity, Bonferroni adjustment was made with significance level reduced to p<0.01.

RESULTS: I
Patient characteristics
We recruited 130 patients. Five forms were incomplete and not suitable for analysis. Table 1 shows the characteristics of patients at baseline.

Structural validity and internal reliability
Our analysis identified four subscales explaining 65.3% of the variance in the 26 items. Table 2 shows the four subscales thus identified (perceived necessity, concerns about exercise, practical barriers and perceived suitability) and the items measuring ("loading on") each subscale. To simplify the table, "off-factor" loadings have been removed, as these never attained $\alpha > 0.4$. Table 2 also shows the reliabilities of the subscales, ranging from 0.70 to 0.79.

The basis of interpretation of the subscales is presented in more detail later.

Interpretation and summary of each subscale
Of the four resulting subscales, one is interpreted as relating to the patients' perceived necessity for cardiac rehabilitation and the remaining three as dimensions of concern.

Subscale 1—perceived necessity: These items seem to consider whether patients feel they have a personal need for, and a coherent understanding of, what they wish to achieve from cardiac rehabilitation programmes. This subscale is scored such that a higher score indicates that the patient is more likely to perceive cardiac rehabilitation as necessary and to be clear as to how it will be of benefit.

Subscale 2—concerns about exercise: This contains items that reflect patients' perceptions of their ability to engage in exercise, and the possible effects of doing so. A higher score indicates that the patient has greater concerns about participating in the exercise component of cardiac rehabilitation, in that it may be harmful in some way.

Subscale 3—practical barriers: The items loading on to this subscale assess the possible influence of practical barriers such as transport and obtaining time off work to attend cardiac rehabilitation programmes. A higher score indicates a greater likelihood that there may be practical barriers to attending the same.

Subscale 4—perceived suitability: Items 23 and 24 refer to patients' perceptions that cardiac rehabilitation is probably not appropriate for them, although it may be suitable for a younger, more active person. A higher score indicates a greater belief that cardiac rehabilitation is probably suitable for a younger, more active person.

Distributional shape and descriptive statistics for each of the subscales
Table 3 shows descriptive statistics for the subscales, which support a normal distribution. The distribution and values of patient scores on each of the subscales indicated that patients in the sample generally held positive beliefs about the role of the cardiac rehabilitation course, although there was some variability in scores. Most patients believed that they had an understanding of cardiac rehabilitation and that it was necessary, but just under a quarter (23.6%) of the patients scored below the scale midpoint. Fewer patients expressed concern about the exercise component of cardiac rehabilitation or thought that practical barriers would prevent them from attending (11% and 13% scored above the midpoint of the scales, respectively) the programme. About a fifth of patients scored above the scale midpoint on the fourth subscale, indicating that they thought cardiac rehabilitation may be more suitable for "others" (ie, people who are younger and who have been previously active).

Discarded Items
Thirteen items failed to load successfully. These included the following:

- Statements relating to aspects of social support—for example, Q8: "I am looking forward to meeting and talking to people who have also had heart attacks" and Q25: "I am more likely to go to cardiac rehabilitation if I can bring someone with me"
- Recommendation of cardiac rehabilitation by significant others—for example, Q16: "My doctors feel I would benefit by attending cardiac rehabilitation"
- Some specific practical barriers—for example, Q18: "My attendance at cardiac rehabilitation may be dependent on my work commitments"

Table 1	Characteristics of patients at baseline
Total	n = 125
Men	104 (83.2)
Women	21 (16.8)
Mean (SD) age, years	58.4 (10.7)
Ethnicity	
Caucasian	115 (92)
Bangladeshi	4 (3.2)
Black Caribbean	5 (4)
Missing	1 (0.8)
Marital status	
Single	19 (15.2)
Married	72 (57.7)
Divorced or separated	24 (19.2)
Widowed	9 (7.2)
Missing	1 (0.8)
Employment	
Employed	70 (56)
Retired	44 (35.2)
Homemaker	3 (2.4)
Unemployed	7 (5.6)
Missing	1 (0.8)
Smoking history	
Present	53 (42.4)
Past	43 (34.4)
Never	27 (21.6)
Missing	2 (1.6)
Regular participation in exercise	
Yes	33 (26.4)
No	84 (67.2)
Missing	8 (6.4)
Activity level	
Low	62 (49.6)
Medium	43 (34.4)
High	17 (13.6)
Missing	3 (2.4)
Depressive disorder	
None	91 (72.8)
Possible	14 (11.2)
Probable	7 (5.6)
Missing	13 (10.4)
Anxiety disorder	
None	75 (60)
Possible	20 (16)
Probable	17 (13.6)
Missing	13 (10.4)

Values are n (%) unless otherwise mentioned.

Table 2 Subscales obtained after principal component analysis

	Factor loadings
Subscale 1: Perceived necessity ($\alpha=0.71$; n=78)	
Q5. I have a clear picture of how cardiac rehabilitation will help the health of my heart	0.739
Q7. I have a clear picture of what I want to achieve by attending cardiac rehabilitation	0.698
Q1. Attending cardiac rehabilitation may help the long-term recovery of my heart condition	0.677
Q6. Some aspects of the cardiac rehabilitation programme are unnecessary for me*	0.665
Q20. I hope that attending cardiac rehabilitation may help me to return to work more quickly	0.653
Subscale 2: concerns about exercise ($\alpha=0.79$; n=96)	
Q10. I am worried that some aspects such as exercise may be harmful to me	0.794
Q19. I am worried that I may not be able to keep up with the exercise part	0.748
Q17. I may not feel physically fit enough to attend cardiac rehabilitation	0.695
Subscale 3: practical barriers ($\alpha=0.70$; n=75)	
Q14. The cost of transport may prevent me from attending cardiac rehabilitation	0.855
Q13. Availability of transport will influence my decision to attend cardiac rehabilitation	0.718
Q22. It would be financially difficult to take time off work to attend cardiac rehabilitation	0.686
Subscale 4: perceived suitability ($\alpha=0.74$; n=100)	
Q24. Younger people are more likely to benefit from cardiac rehabilitation than an older, less active person	0.863
Q23. Cardiac rehabilitation is probably more suitable for people who have been previously active	0.770

*This item was reverse scored, hence factor loading is not negative.

Intercorrelations between the subscales

We found relationships of low to moderate strength between the subscales, which seem to be logical. A high score on the necessity factor is negatively related to concerns about exercise ($r = -0.32$, $p<0.001$) and the belief that the cardiac rehabilitation programme is more suitable for a younger, more active person ($r = -0.19$, $p<0.05$). Concerns about exercise are similarly positively related to both practical barriers ($r = 0.45$, $p<0.001$) and suitability ($r = 0.33$, $p<0.001$).

RESULTS: II. CRITERION AND CONSTRUCT VALIDITY
Criterion (predictive) validity

To establish criterion (predictive) validity, it was hypothesised that non-participants would have a lower score on the necessity subscale than participants, but have a higher score on subscales 2, 3 and 4—that is, they believe that the exercise component of the cardiac rehabilitation programme could be harmful, that there are practical barriers to attending and that the programme is more suitable for younger, active people. We found statistically significant differences in the suitability and necessity beliefs about the programme held by attenders and non-attenders in the predicted direction (table 4). Differences in the other two subscales, although not significant, are in the predicted direction. The age of the patient may be closely related to beliefs regarding suitability of the programme; so this analysis was repeated including age as a covariate, but the results were unchanged.

Construct validity

Measures of intention of patients to attend the cardiac rehabilitation programme, beliefs about illness (using the IPQ-R),[16] baseline levels of exercise and views about exercise as well as causal attributions for heart disease were used to examine construct validity.

We found significant differences on all four subscales in the predicted direction between those intending and not intending to attend the programme before hospital discharge (table 4). However, intention is by no means a gold standard measure of behaviour, and was non-significant as a predictor variable

Table 3 Descriptive statistics for each subscale

Statistics		Subscales			
		1: Necessity	**2: Concerns about exercise**	**3: Practical barriers**	**4: Perceived suitability**
n	Valid*	123	119	106	105
	Missing	2	6	3	4
Mean		17.69	7.55	7.55	4.97
Standard error of mean		0.25	0.20	0.26	0.17
Standard deviation		2.82	2.26	2.72	1.83
Minimum		9	3	3	2
Maximum		25	14	15	10

*Valid data: items pertaining to factors 3 and 4 were omitted from the first 16 questionnaires, the potential number of valid cases is thus 109.

Table 4 Comparison of scores on subscales between those attending and not attending the cardiac rehabilitation programme, and intenders and non-intenders

Subscales	Number of patients			
	Intended n=80	**Did not intend n=40**	**Attended n=80**	**Did not attend n=37**
Perceived necessity	18.4 (2.7)	16.7 (2.6)***	18 (2.75)	16.9 (3.0)*
Concerns about exercise	7.3 (2.2)	8.3 (2.4)***	7.2 (2.1)	7.9 (2.4)
Practical barriers	7.0 (2.4)	8.8 (2.9)***	7.1 (2.6)	7.8 (2.5)
Perceived suitability	4.5 (1.6)	6.1 (1.7)***	4.6 (1.7)	5.6 (1.9)**

Subscale scores are mean (SD).
Eight patients were reported deceased or deferred from the cardiac rehabilitation programme as a result of comorbidity after hospital discharge; they are thus excluded from analysis.
*$p<0.05$; **$p<0.01$; ***$p\leqslant0.001$.

($\chi^2 = 2.9$, df 1; $p = 0.088$); 73% of patients who intended to attend subsequently did so compared with 57% of those who did not or who were unsure, making this group's behaviour less predictable. The role of intention and its use as an indicator of discriminant validity should be interpreted with caution.

Patients' beliefs about illness were logically correlated with their scores on the subscales. Patients who perceived cardiac rehabilitation as necessary were more likely to have stronger beliefs in the treatment ($r = 0.32$, $p = 0.001$), personal control ($r = 0.22$, $p = 0.017$) of their illness and a clearer understanding of the nature of their illness ($r = -0.27$, $p = 0.004$). Patients with higher concerns about the exercise aspects of the programme had weaker beliefs in personal control over their condition ($r = -0.35$, $p = 0$), a poorer understanding of their condition ($r = 0.35$, $p < 0.001$) and a stronger perceived emotional effect ($r = 0.21$, $p = 0.024$). Similarly, those patients who identified greater practical difficulties associated with attending cardiac rehabilitation thought that they had less personal control over their condition ($r = -0.21$, $p = 0.036$), and perceived more associated negative consequences ($r = 0.20$, $p = 0.041$) and an emotional effect from the same ($r = 0.23$, $p = 0.024$). Finally, patients who perceived cardiac rehabilitation as less suitable for themselves tended to have a poorer understanding of their condition ($r = 0.43$, $p < 0.001$) and to see it as less amenable to treatment control ($r = -0.23$, $p = 0.02$). It should be noted that the weaker associations reported here ($r < 0.3$) are lost after Bonferroni correction.

The relationship between concerns regarding the exercise component of the programme (subscale 2), baseline views about undertaking physical activity and baseline levels of exercise is logical, with patients who reported a low baseline level of exercise having greater concerns regarding the exercise component of cardiac rehabilitation than those who reported a high baseline level of exercise (7.9 (SD 2.3) v 6.3 (SD 2.4), $p = 0.038$). Similarly, there was a low to medium negative correlation between scores reflecting views about undertaking physical activity and concerns about the exercise component of the programme ($r = -0.22$, $p = 0.024$). Once again, both results failed to retain significance after Bonferroni correction.

Patients who reported that they took part in regular planned sport or exercise were less likely to report concerns about exercise than those who did not, although this was not significantly different (7.2 (SD 1.9) v 7.6 (SD 2.3), $p = 0.40$).

The relationship between endorsement of certain causal attributions for heart attack and scores on the subscales are logical, supporting construct validity. Those patients who believed their heart attack was due to chance or bad luck were less likely to believe that cardiac rehabilitation was necessary compared with those who did not (16.5 (SD 3.4) v 18.4 (SD 2.4), $p = 0.008$), and were also more likely to endorse the view that cardiac rehabilitation may be suitable for others, but not for them (5.5 (SD 1.7) v 4.7 (SD 1.8), $p = 0.028$).

Although statistical significance was lost after Bonferroni correction, patients who attributed their heart attack to ageing were more likely to endorse the view that the cardiac rehabilitation programme may be more suitable for those who were previously active and are younger than those who did not believe that their heart attack was due to ageing (5.4 (SD 2.0) v 4.4 (SD 1.5), $p = 0.028$). These patients were also likely to express concerns regarding the exercise component of the programme (8.0 (SD 2.4) v 7.0 (SD 2.1), $p = 0.018$).

DISCUSSION

We aimed to develop a valid and reliable measure of patients' beliefs regarding cardiac rehabilitation after AMI and to ascertain the relationship between such beliefs and attendance at the programme. Four subscales were produced through analysis of the dataset generated and, consistent with the Necessity–Concerns framework, these were divided into beliefs regarding the understanding and necessity of cardiac rehabilitation, and beliefs about concerns regarding attendance at the cardiac rehabilitation programme. The concerns about cardiac rehabilitation include those about undertaking exercise or physical activity, and practical barriers—namely, availability and cost of transport and financial implications of taking time off work. The fourth factor comprises two items about perceptions of suitability—that is, that cardiac rehabilitation is more suitable for younger, previously active people. These four subscales showed good internal reliability and had proved validity with regard to some measures of criterion (predictive) and construct (discriminant) validity.

The actual attendance rate at a cardiac rehabilitation programme was related to the subscales in the hypothesised manner. Scores of two of the subscales—necessity and suitability—differed considerably between attenders and non-attenders. Although scores measuring concerns about the exercise component of cardiac rehabilitation and those measuring practical barriers differed as hypothesised between attenders and non-attenders, these did not reach statistical significance.

This is the first questionnaire that has been developed to assess patients' beliefs about cardiac rehabilitation. The evaluation is encouraging, showing evidence of internal reliability and validity. However, our study has limitations and further studies are necessary to fully validate the questionnaire. Some observations between the subscales and other measures lost significance after Bonferroni correction, and these aspects of construct validity require confirmation in a larger patient sample. Test–retest reliability should be confirmed, possibly 2 weeks after discharge from hospital; this would also control for the effects of mood congruency. Further studies should include populations that are often excluded from the cardiac rehabilitation programme, such as women, and people from ethnic minority groups and patients from different socioeconomic groups, as our sample included predominantly white males. External validity also needs to be established with regard to patients who have not had AMI but who have undergone angioplasty or coronary artery bypass grafting or who have angina, as current guidelines advocate that these patients also attend the cardiac rehabilitation programme.

However, our findings suggest that this questionnaire may be a useful tool in helping to predict whether patients who have had AMI will attend the cardiac rehabilitation programme, and therefore to determine which patients may derive particular benefit from interventions aimed at increasing cardiac rehabilitation uptake. Evidence suggests that interventions targeting specific cardiac beliefs or misconceptions of patients are helpful. A randomised controlled trial conducted during hospitalisation for AMI was successful at eliciting common cardiac misconceptions and replacing these with more helpful beliefs.[18] Similarly, The Angina Plan and The Heart Manual are interventions that directly target cardiac misconceptions.[19 20] Reductions in psychological distress, physical limitations, reported angina and associated use of the reliever drug glyceryl trinitrate spray have been reported, as have self-reported increases in daily walking, dietary changes, reduced healthcare contact and hospital readmission.

A recently conducted randomised controlled trial conducted during hospitalisation after AMI challenged beliefs about illness (measured using the IPQ-R) that were previously associated with poorer outcome.[21] Intervention recipients rated themselves as having a higher level of understanding of their heart condition and being better prepared to leave hospital.

They had more helpful beliefs about illness, were less likely to report angina pain at 3 months and returned faster to work.

All patients participating in our study had been invited by the cardiac rehabilitation team to participate in a cardiac rehabilitation course after their discharge from hospital, and would usually have spent up to 1 h with a nurse from the team. Despite this, about a fifth of patients were unsure that cardiac rehabilitation could help them, and held concerns regarding the physical activity component that affected their attendance behaviour. We would suggest that after further satisfactory validation, this scale could be completed by patients before discharge from hospital, in order to identify those whose beliefs indicate that it is unlikely they will attend the cardiac rehabilitation programme; it may also be beneficial to assess at this time patients' beliefs regarding their cardiac disease, using validated scales (ie, from the Angina Plan, the Heart Manual or the IPQ-R). This may enable assessment of interventions that target specific misconceptions, thus increasing attendance and optimising the overall outcome and recovery.

. . . .

Authors' affiliations
A F Cooper*, G Jackson, Cardiothoracic Centre, Guy's & St Thomas' NHS Foundation Trust, London, UK
J Weinman, M Hankins, Health Psychology Section, Department of Psychology, Institute of Psychiatry, Guy's Hospital Campus, London, UK
R Horne, Centre for Healthcare Research, Postgraduate Medical School, University of Brighton, Brighton, UK

Competing interests: None.

*Also Centre for Healthcare Research, Postgraduate Medical School, University of Brighton, UK

Ethical approval: The study received local research ethical committee approval from St Thomas' Hospital Local Research Ethics Committee, London, UK.

REFERENCES
1 **Jolliffe JA**, Rees K, Taylor RS, *et al.* Exercise based rehabilitation for coronary heart disease. *Cochrane Review. Cochrane Library.* Issue 2. Chichester, UK: Wiley, 2004.

2 **Clark AM**, Hartling L, Van der Meer B, *et al.* Secondary prevention programs for patients with coronary artery disease: a meta-analysis of randomized trials. *Ann Intern Med* 2005;**143**:659–72.

3 **Cooper AF**, Jackson G, Weinman J, *et al.* Factors associated with cardiac rehabilitation attendance: a systematic review of the literature. *Clin Rehabil* 2002;**16**:541–52.

4 **Grenier O**, Cambou JP, Ferrieres J, *et al.* Secondary prevention in women with acute coronary syndrome in France: results of the PREVENIR survey. *Eur Heart J* 1999;**20**(Abstr Suppl):656.

5 **Bunker S**, McBurney H, Cox H, *et al.* Identifying participation rates at outpatient cardiac rehabilitation programs in Victoria, Australia. *J Cardiopulm on Rehabil* 1999;**19**:334–8.

6 **Department of Health**. Cardiac rehabilitation. In: *National service frameworks: coronary heart disease.* London: Department of Health, 2000.

7 **Horne R**. Representations of medication and treatment: advances in theory and measurement. In: Petrie K, Weinman J, eds. *Perceptions of illness and health: current research and applications.* London: Harwood Academic, 1997:155–87.

8 **Horne R**, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *J Psychosom Res* 1999;**47**:555–67.

9 **Horne R**, Weinman J. Self-regulation and self-management in asthma: exploring the role of illness perceptions and medication beliefs in explaining behavioural components of non-adherence to preventive medicines. *Psychol Health* 2002;**17**:17–32.

10 **Ross S**, Walker A, MacLeod MJ. Patient compliance in hypertension: role of illness perceptions and treatment beliefs. *J Hum Hypertens* 2004;**18**:607–13.

11 **Wyer SJ**, Earll L, Joseph S, *et al.* Deciding whether to attend a cardiac rehabilitation programme: an interpretative phenomenological analysis. *Coron on Health Care* 2001;**5**:178–88.

12 **Moore SM**. Women's views of cardiac rehabilitation programs. *J Cardiopulm Rehabil* 1996;**16**:123–9.

13 **Tod AM**, Lacey EA, McNeill F. 'I'm still waiting…': barriers to accessing cardiac rehabilitation services. *J Adv Nurs* 2002;**40**:421–31.

14 **Clark AM**, Barbour RS, Whelan HK, *et al.* A realist study of the mechanisms of cardiac rehabilitation. *J Adv Nurs* 2005;**4**:362–71.

15 **Cooper AF**, Jackson G, Weinman J, *et al.* A qualitative study investigating patients' beliefs about the role of cardiac rehabilitation in recovery from myocardial infarction. *Clin Rehabil* 2005;**19**:87–96.

16 **Moss-Morris R**, Weinman J, Petrie KJ, *et al.* The Revised Illness Perception Questionnaire (IPQ-R). *Psychol Health* 2002;**17**:1–16.

17 **Zigmond AS**, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand* 1983;**67**:361–70.

18 **Thompson DR**. A randomised and controlled trial of in-hospital nursing support for first time myocardial infarction patients and their partners; effects on anxiety and depression. *J Adv Nurs* 1989;**14**:291–7.

19 **Lewin B**, Robertson IH, Cay EL, *et al.* Effects of self-help with post-myocardial infarction rehabilitation on psychological adjustment and the use of health services. *Lancet* 1992;**339**:1036–40.

20 **Lewin RJP**, Furze G, Robinson J, *et al.* A randomised controlled trial of a self-management plan for patients with newly diagnosed angina. *Br J Gen Pract* 2002;**52**:194–201.

21 **Petrie KJ**, Cameron LD, Ellis CJ, *et al.* Changing illness perceptions after myocardial infarction: an early intervention randomised controlled trial. *Psychosom Med* 2002;**64**:580–6.